Evaluating Inline Inspection Results

Presented By
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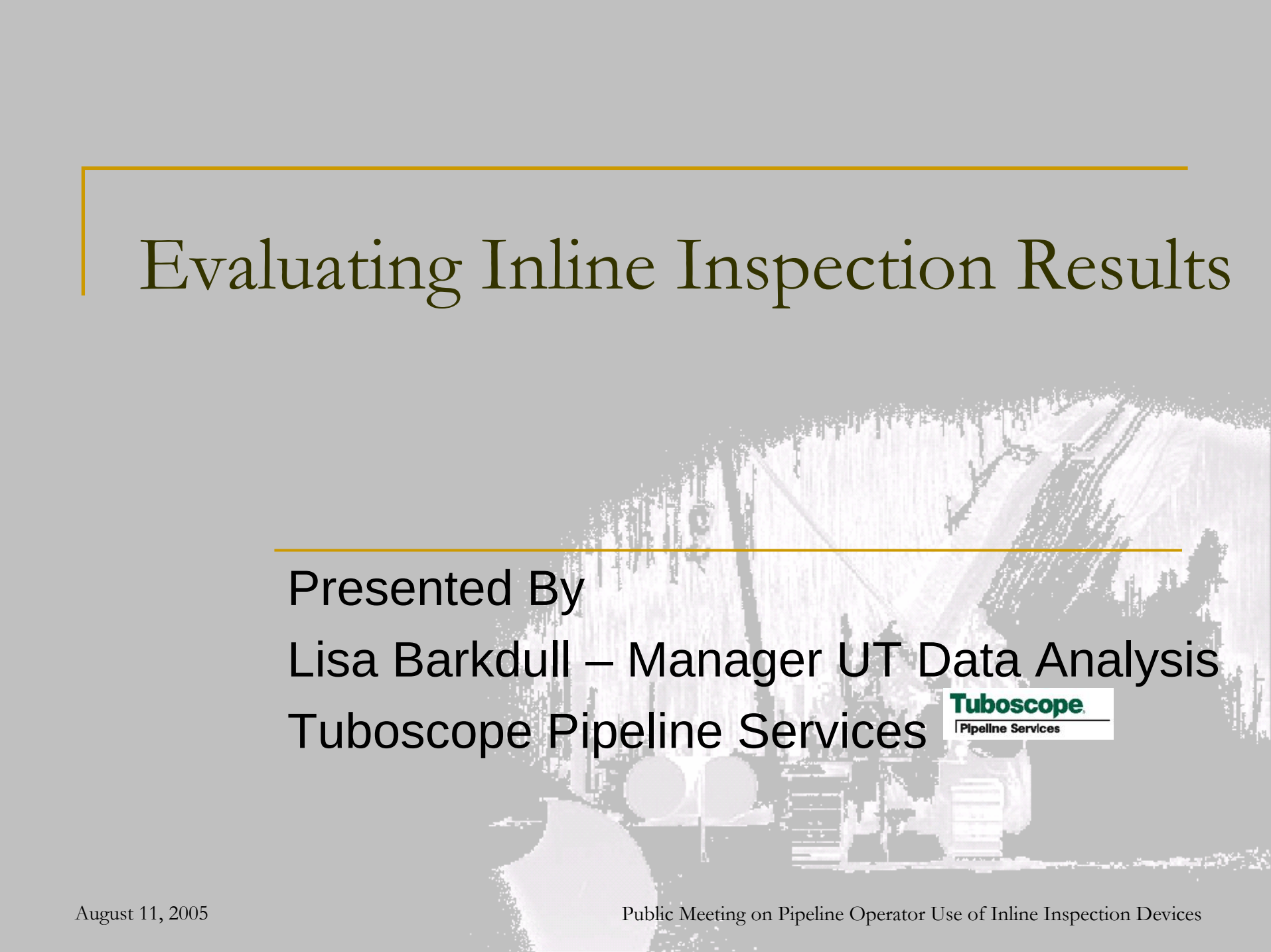
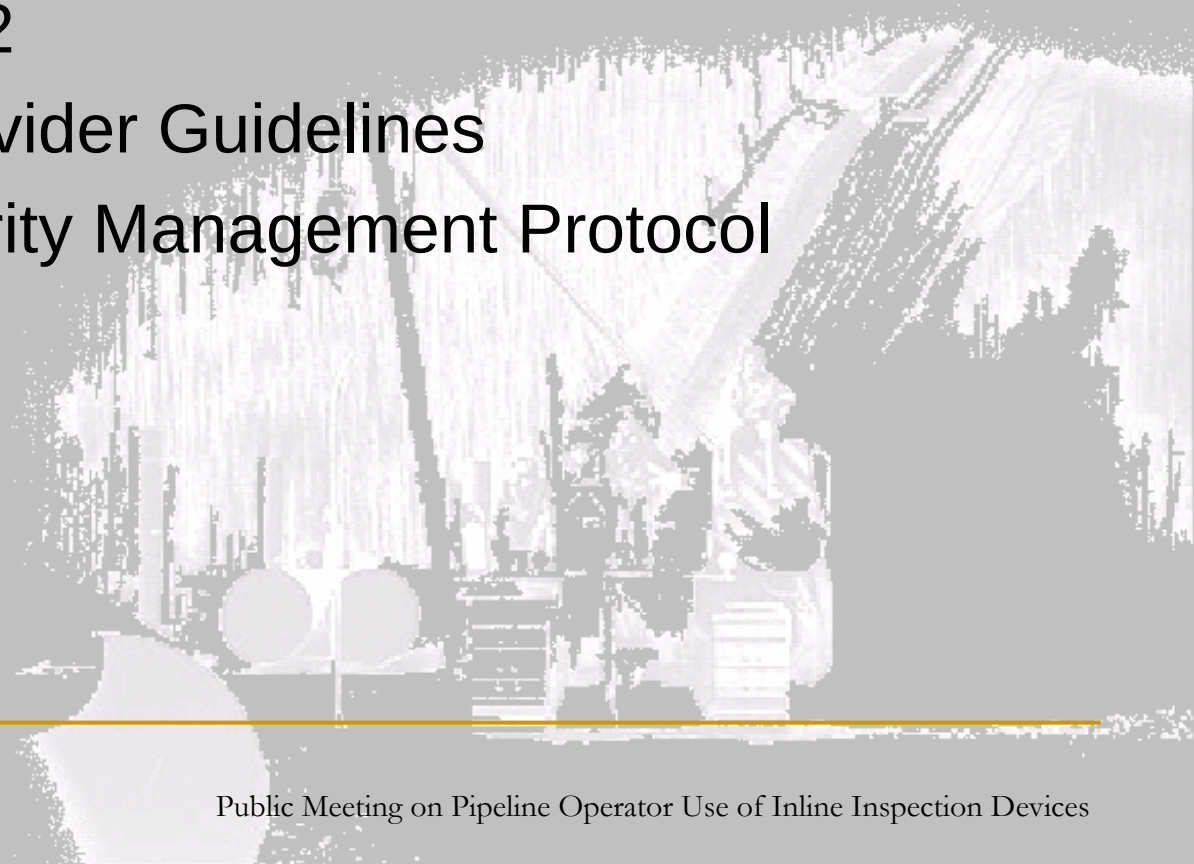


Frequently Asked Questions

- What is the process to evaluate ILI survey results?
- Are verification digs necessary?
- If so, how many?
- What type of information does the ILI service provider expect from the field?
- How is this information used?
- How important is it to understand the accuracy of ILI survey results?

What is the process to evaluate ILI survey results?

- Use available Standards and References
  - API 1163
  - NACE RP 0102
  - ILI Service Provider Guidelines
  - Operator Integrity Management Protocol



API 1163

- Section 9 specifically addresses “System Results Verification”
- The process of evaluating ILI results is outlined:
  - Process validation
  - Comparison with historic data from the pipeline being inspected
  - Comparison with historic data or large-scale test data from the ILI system being used
  - Criteria to determine whether “verification measurements “ are recommended

Process Validation

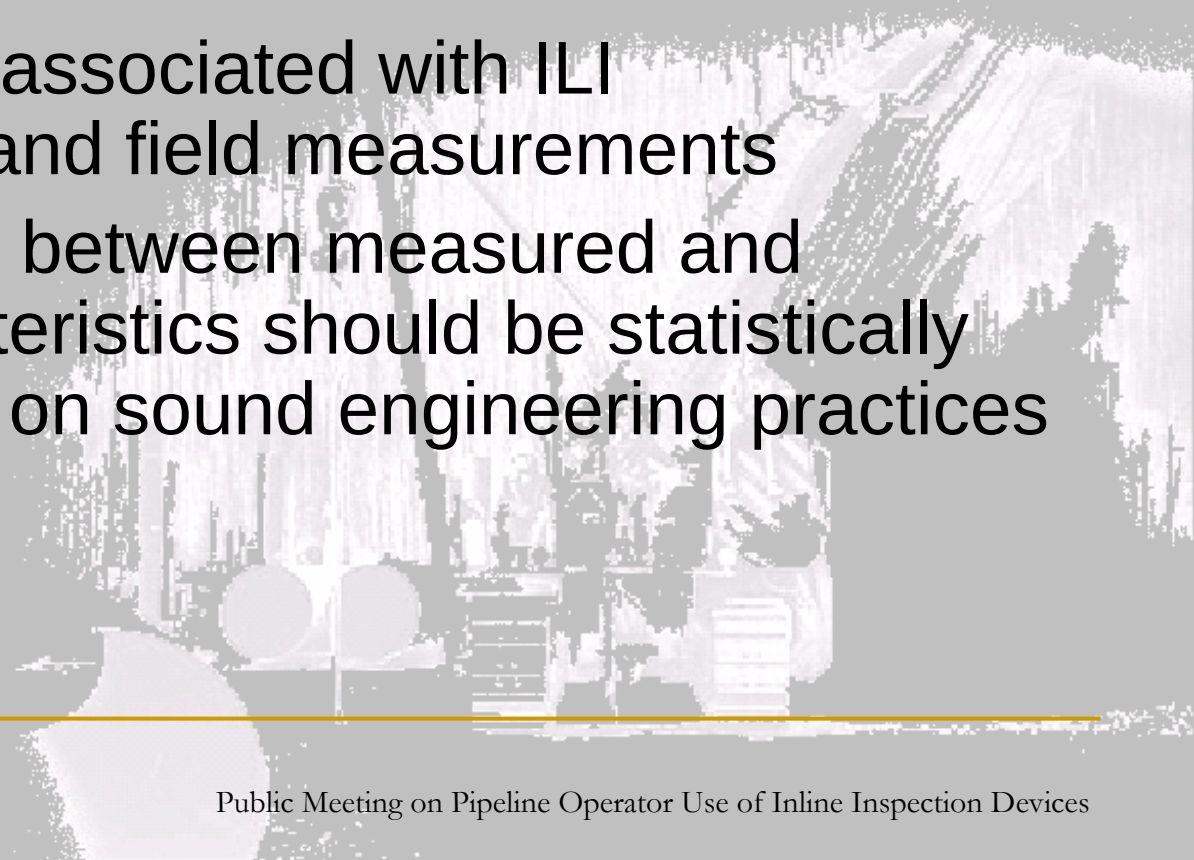
- Confirmation of data analysis processes
- Comparison of recorded data with previous data
  - Use previous excavation and repair information
  - Use previous surveys with similar pipeline characteristics
- Comparison of reported locations and types of pipeline components to actual locations and types of pipeline components

Verification Digs

- Use API 1163 as a guideline to determine if verification measurements are recommended
  - Historic data for line not available
  - Limited amount of historic data or large scale test data available for ILI system
  - Discrepancies found during Process Validation
- Integrity Management protocol requires excavations

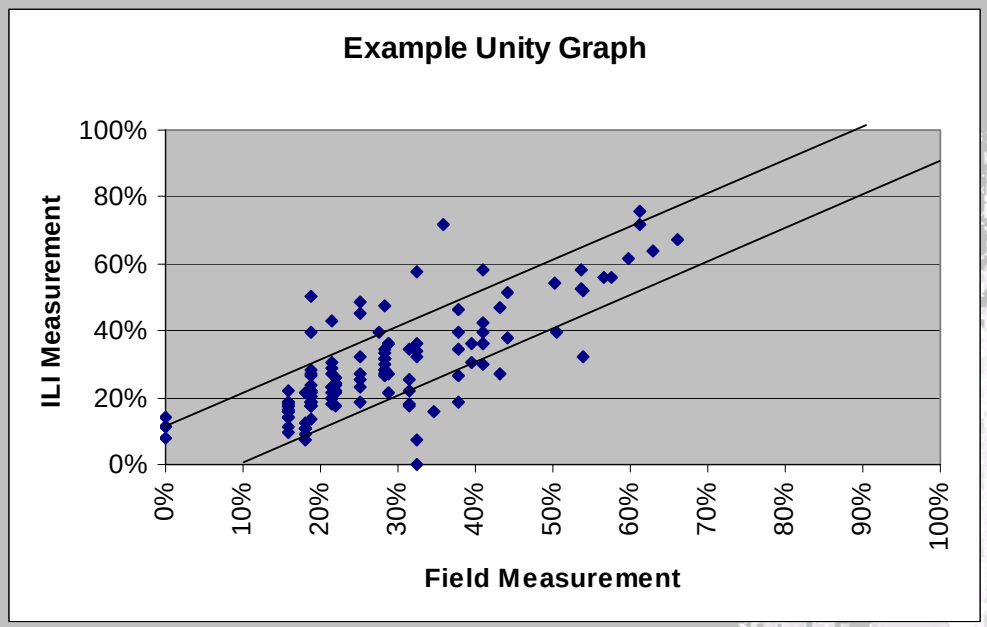
Verification Digs

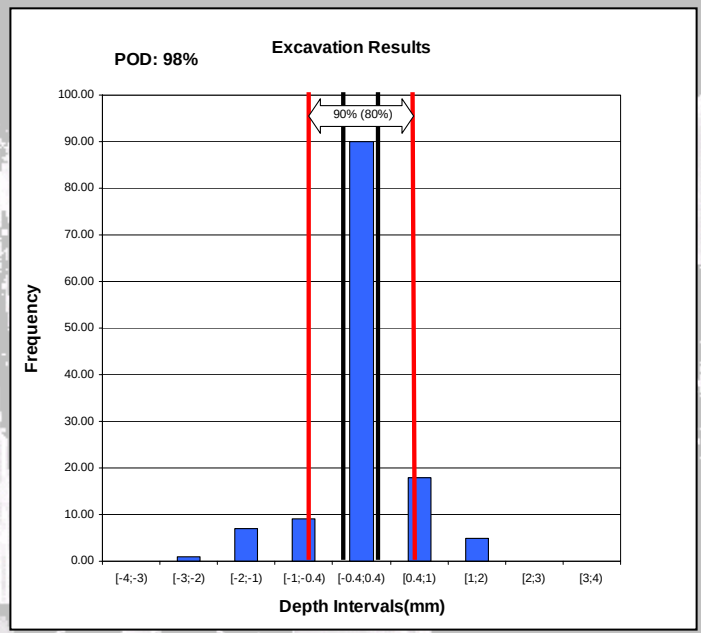
- Understand detection thresholds, measurement thresholds, reporting thresholds, and interaction criteria prior to excavation
- Consider errors associated with ILI measurements and field measurements
- The comparison between measured and reported characteristics should be statistically valid and based on sound engineering practices



Verification Digs

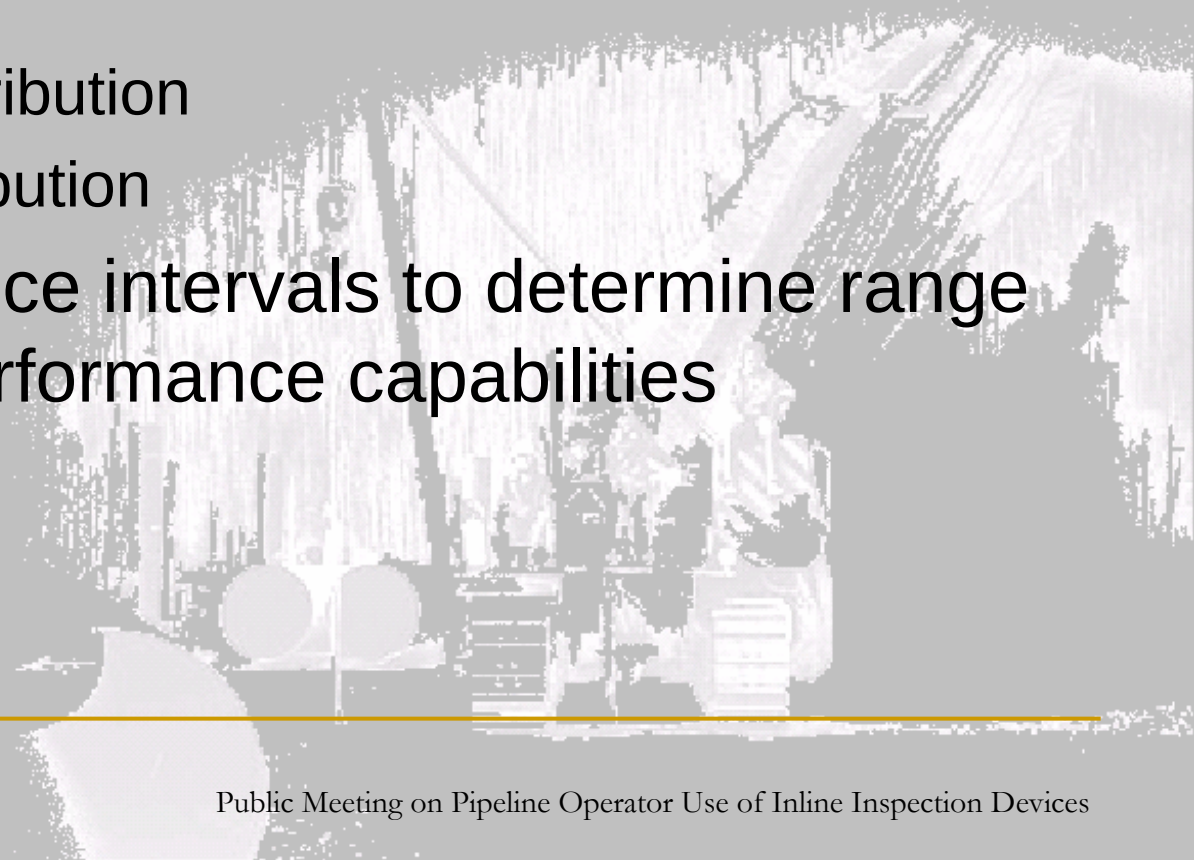
- Compare dig results to tool specification





Verification Digs

- See if the dig results are statistically consistent with tool specifications using distribution functions
  - Binomial Distribution
  - Normal Distribution
- Build confidence intervals to determine range of true tool performance capabilities

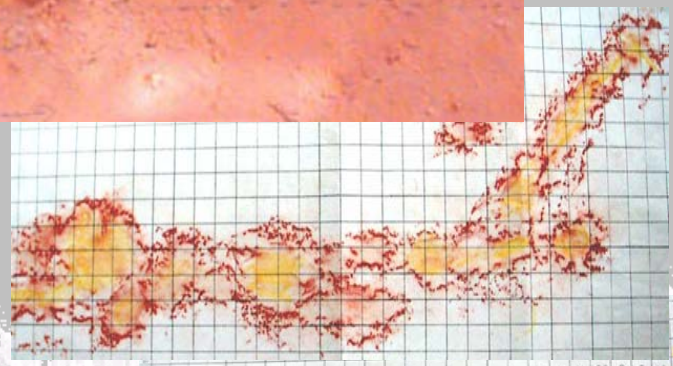


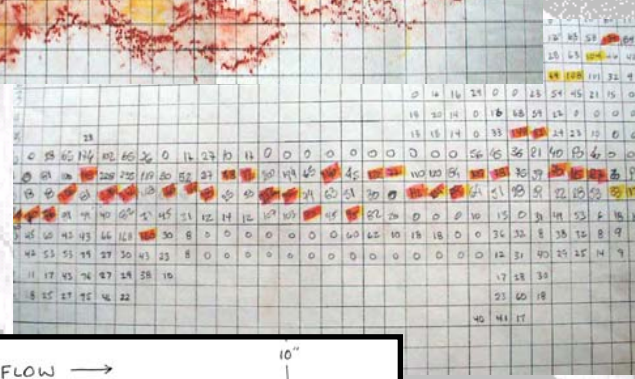
Verification Digs

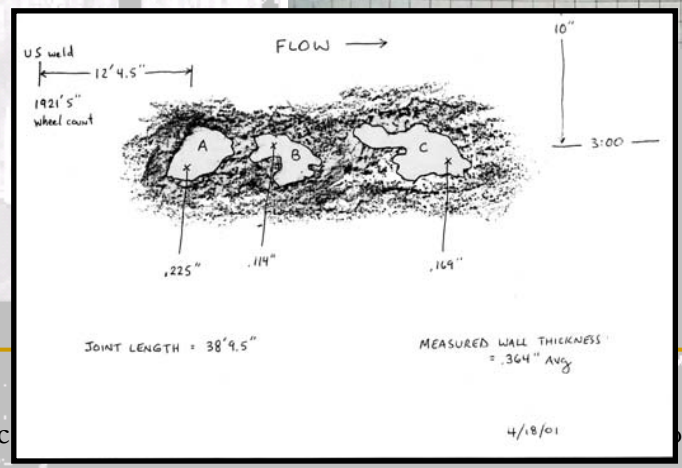
- The number of verification measurement depends on
  - The amount of historical data associated with the pipeline and/or the ILI system
    - Use previous excavation and repair information
    - Use previous results from surveys with similar pipeline and survey characteristics
  - The confidence level associated with tool specifications

Feedback Loop

- Information from verification measurements should be forwarded to service provider
  - Format of information can be agreed on between operator and service provider
  - Quality and accuracy of information gathered is important
  - This includes measurements that are within and not within tolerance







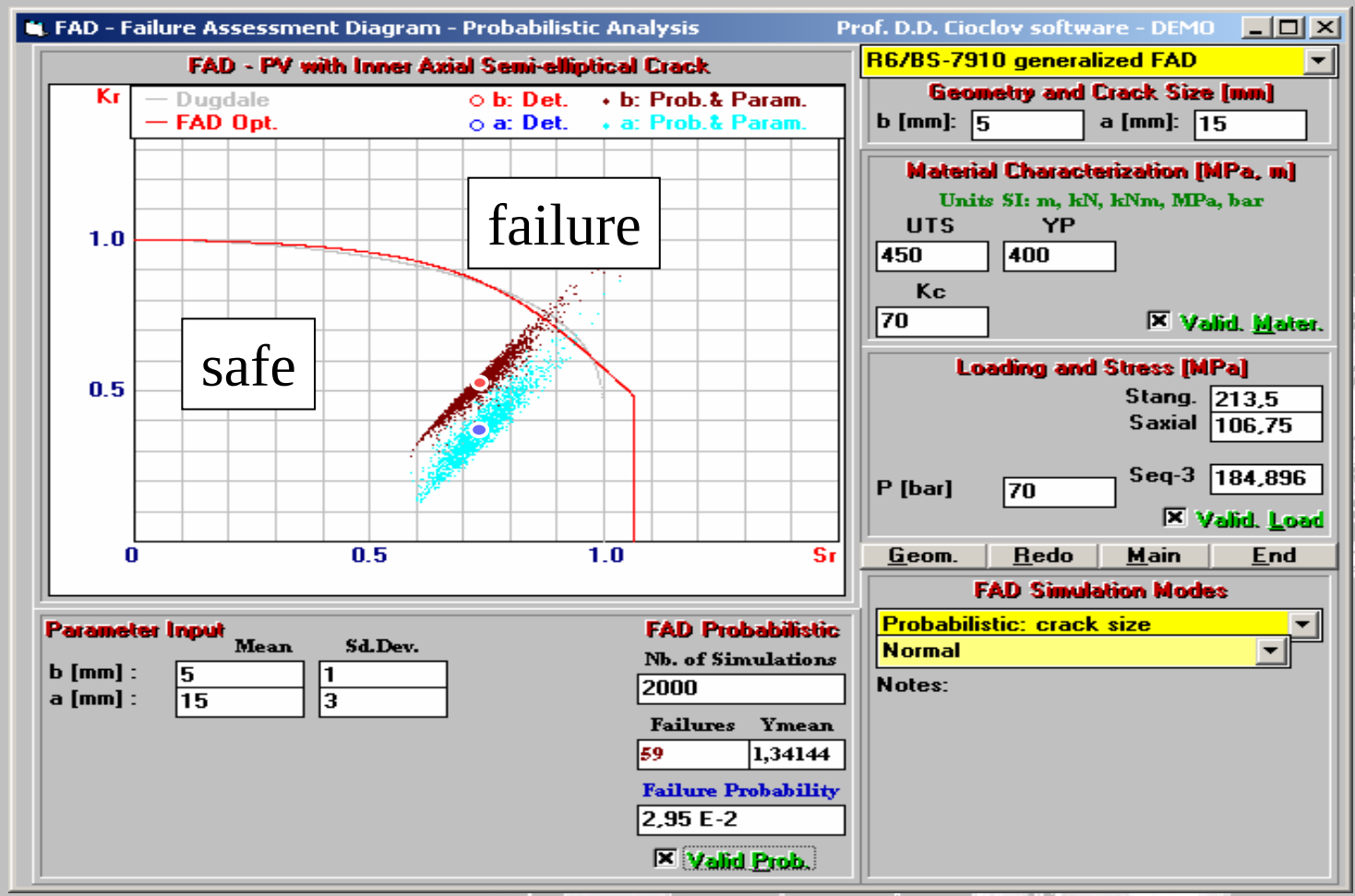
Feedback Loop

- Any discrepancies between the reported inspection results and verification measurements that are outside the tool specifications should be reviewed and source identified
- Tool specifications can be confirmed or re-established based on information provided during the feedback loop
- Allows for continual improvement of data analysis processes

Understanding Accuracy of ILI Results

- Allows the operator to implement an optimal repair and mitigation program
- Allows ILI service providers to offer advanced analysis methods
  - Pressure Based Anomaly Assessment
    - Crack Assessment
    - Metal Loss Assessment
  - Growth Analysis
  - Fitness for Purpose Applications
  - Failure Assessment Diagrams

Understanding Accuracy of ILI Results



Understanding Accuracy of ILI Results

- Allows for modeling the remainder of data set within an ILI survey
  - Estimate Probability of Detection (POD) and Probability of Identification (POI)
  - Calculate True Positives (TP), False Positives (FP), and False Negatives (FN)
  - Approximate distributions for various reported features

Conclusion

- Successful evaluation of ILI survey results is possible using a systematic approach and communication between all parties involved
- Understanding the accuracy of ILI survey results aids in the implementation of an optimal repair and mitigation program
- And enhances the ability of service providers to implement advanced analysis methods

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